

Headache of Extracranial Origin

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• The cervical spine, usually regarded as a supporting structure for the head, is also an important viaduct of vessels and nerves which must function with little clearance in a congested and moving space bounded by bone. Pressure in this viaduct is an important cause of headache.

The cervical foramina although apparently roomy, are constricted by cartilage, by the vertebral artery and its adnexae, and by the lateral intervertebral joints. Osteophytosis, swelling or adhesion in this constricted space almost inevitably causes painful vascular or neural disorder.

In certain postures of the neck the vertebral artery is constricted or even occluded. Traction

or sprain may likewise cause headache through disturbance of the vertebral arterial nerves, the posterior cervical autonomic system or the spinal accessory nerves which originate in delicate filaments from all points of the cervical spinal cord.

A syndrome described by Skillern—migraine-like suboccipital and retro-orbital headache—is due to disturbance of the second cervical nerve, which communicates with the first division of the trigeminal nerve.

Headache due apparently to a minor scalp contusion may really be due to irritation of a trigger area at the site of an old scalp injury.

BY ONE OF THOSE unconscious divisions which assign the medical specialties according to certain anatomic landmarks, the cervical spine has become the province of the orthopedic surgeon. As a consequence, anatomic studies of the cervical spine, with its delicate and complex nerves and blood vessels, usually emphasize the skeletal structures. Some very important organs are not given enough attention, and others are completely ignored, because of their seeming structural unimportance; but these are the very elements that, as the result of some disorder or injury, give rise to most headaches of extracranial origin. To the neurologist and the neurosurgeon, the spinal skeleton is important only as the support and viaduct of nerves and vessels which may suffer from encroachment due to any slight dislocation. This view may provide answers to some of our baffling problems of headache.

CERVICAL FORAMINAL ENCROACHMENT

Encroachment within the cervical foramina, irritating the nerve roots, may be due to occupational or disease deformity or to bony overgrowth, but most often it is due to trauma. Jackson⁴ expressed belief that 90 per cent of patients with symptoms of cervical nerve-root irritation have had a sprain of the cervical spine at some time. Often the injury is minor and eventually forgotten.

The transverse foramina of the cervical spine appear roentgenographically to be relatively large, because the soft structures that partition the opening—the vertebral artery and its adnexae (Figure 1)—

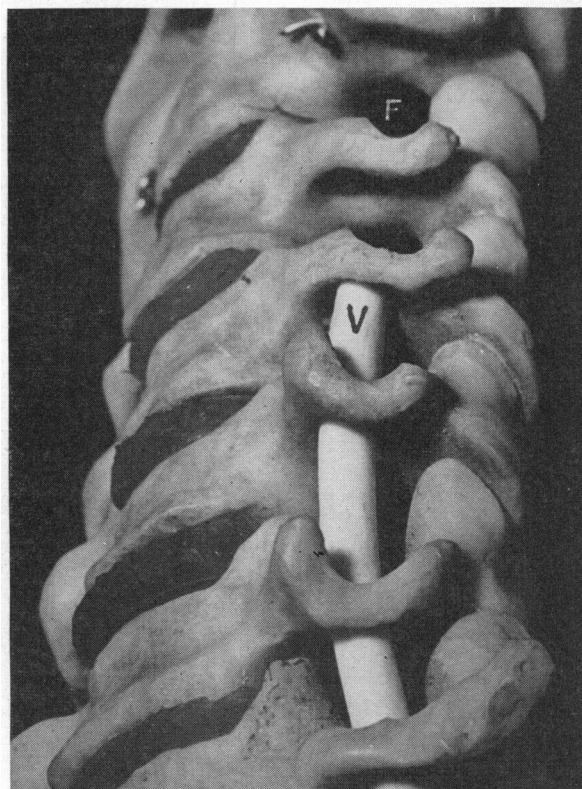


Figure 1.—Cervical vertebrae showing: F—Intervertebral foramen; V—Vertebral artery with transverse foramina.

do not appear in this medium. Altogether three-fourths of the lateral diameter of the foramen is occupied by structures other than the nerve root, and additional space may be occupied by the rarely mentioned lateral intervertebral joint.

Presented before the Section on Psychiatry and Neurology at the 87th Annual Session of the California Medical Association, Los Angeles, April 27 to 30, 1958.

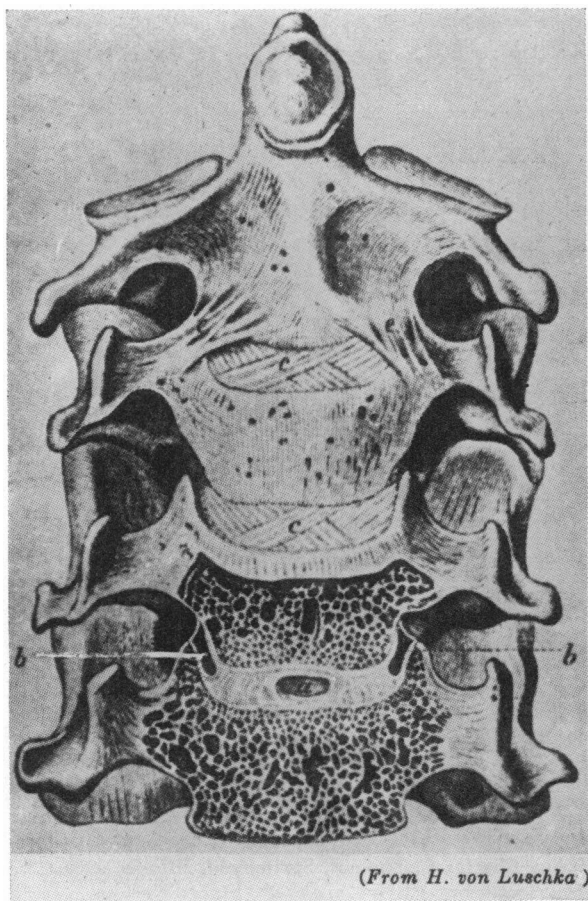


Figure 2.—Lateral co-vertebral articulations of H. von Luschka (b). Reproduced by permission from Eugene Neuwirth: Neurologic complications of osteoarthritis of the cervical spine, New York State J. Med., 54:2584.

Lateral Intervertebral Joints³

In the lumbar region the intervertebral disc covers the entire vertebra; but in the cervical area the disc does not extend to the lateral margins of the vertebrae adjoining it; on either side of it lies a small synovial joint. These synovial joints were first described by Von Luschka¹² in 1858 (Figure 2). They have been variously named covertebral articulations, uncovertebral joints, and neurocentral joints. Jackson⁴ appropriately named them lateral intervertebral joints.

Where the nerve root emerges from the vertebra it is in intimate contact with the lateral intervertebral joint, and is subject to potential irritation with every turn of the head. On degenerative thinning of the disc (especially after trauma) the processes of the lateral joints are gradually forced out laterally, causing spurs or osteophytes (Figure 3). These spurs project either laterally, encroaching upon the intervertebral foramen, or anteriorly toward the vertebral artery in the transverse foramen (Figure 4). Capped with cartilage, these osteophytes are

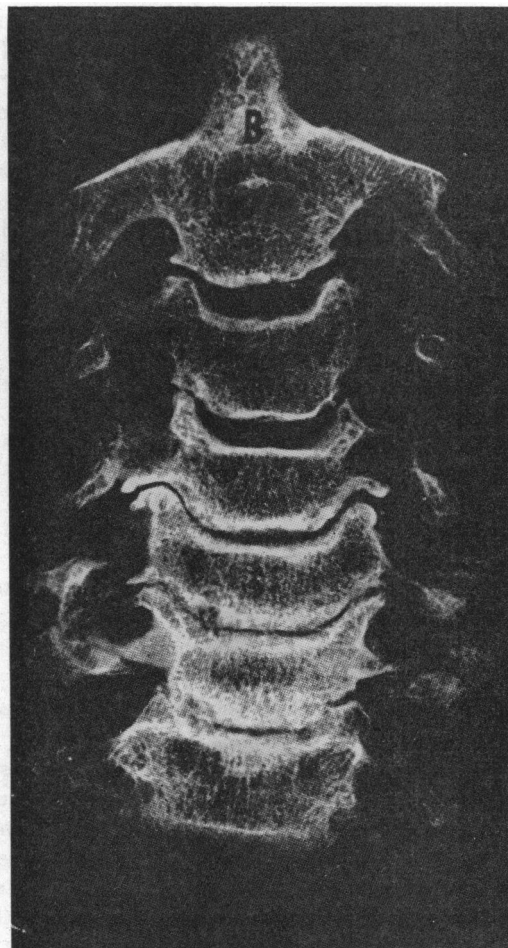


Figure 3.—Degenerative thinning in the lower three cervical discs. Osteophytes have developed laterally, as a result of the intervertebral impingement. (Reproduced by permission from L. A. Hadley: The Spine, Charles C. Thomas, Springfield, Illinois, 1956.)

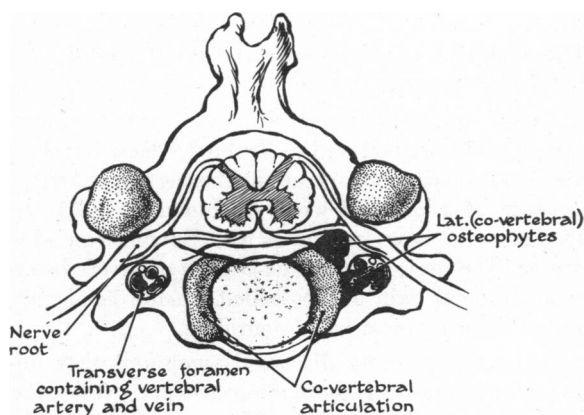


Figure 4.—Cervical vertebra showing the lateral intervertebral joint and the lateral osteophytes encroaching upon the cervical nerve root and the vertebral artery.

considerably bulkier than the roentgenogram discloses (Figure 5). Another source of irritation may result from neck sprain in which hemorrhage into

the capsular ligaments of the lateral joints, no matter how minute, causes adhesions, as it often does, between the ligaments and the dural sleeve of the nerve roots. A normal appearance, therefore, on roentgen studies—even opaque myelograms—of the cervical spine does not rule out nerve irritation as a cause of pain. The author has observed, at operation, severe nerve root swelling and dural adhesion at this point, despite failure to demonstrate the abnormality by roentgenography and electromyography.

The Vertebral Artery

Lewis and Coburn⁵ demonstrated by angiography of the vertebral artery that in certain postures of the neck the artery is constricted or even occluded, and they correlated these pressures with pain in the upper neck and with suboccipital headache. The usual site of occlusion is the interspace between the first and second cervical vertebrae, the point of greatest movement. Tissington-Tattlow and Bammer¹¹ showed, by arterial injection in cadavers, complete obstruction of the vertebral artery on turning of the head.

Pratt-Thomas and Berger⁸ reported three cases of death following chiropractic manipulations of the neck. Ford and Clark² reported two other cases of death several days after cervical manipulations. In these cases the symptoms consisted of severe headache, vertigo, diplopia and ataxia. At autopsy, thrombi were found in the vertebral and basilar and cerebellar vessels. The authors believed that the lesion was initiated in the vertebral artery at the first cervical interspace. (The vertebral artery supplies important areas of the lower pons and medulla, where many cranial nerves originate.)

NERVE DISTURBANCES

The Vertebral Arterial Nerves and the Posterior Cervical Autonomic System

Barre¹ in 1925 described a migraine-like syndrome which he believed to be due to disturbance of the sympathetic network about the vertebral artery. Because of additional work by Lieou in 1928, the syndrome is now known as the Barre-Lieou syndrome. The major symptoms consist of severe headache, cervical pain and so-called tension headaches and at times atypical facial neuralgia.

Neuwirth⁷ recently discussed symptoms that follow disturbance of the vertebral nerve following sprain of the cervical spine. These consist of severe headache, diplopia and ataxia and at times disturbance in swallowing. The vertebral nerve originates from the stellate ganglion and ascends in the transverse foramen, along with the vertebral artery. It supplies the vertebral and basilar arteries—the major blood supply to the pons and medulla, includ-



Figure 5.—Section of cervical spine from elderly patient. The fifth foramen (X) has remained essentially normal and is seen in microscopic section at top right (X). (S) sensory, (M) motor root. The seventh cervical foramen, (Y) bottom right, shows encroachment of marginal osteophytes (O). The nerves in this foramen (S and M) are flattened and show thickening of the perineurium. (Reproduced by permission from L. A. Hadley, *The Spine*, Charles C. Thomas, Springfield, Illinois, 1956.)

ing the area that contains the nuclei of origin of the fifth, sixth, seventh, eighth, ninth, tenth and eleventh cranial nerves.

The Upper Cervical Nerves

The spinal accessory nerve, with the exception of a small group of fibers, takes origin by many filaments from practically the entire length of the cervical spinal cord.⁹ Any acute torsion, flexion, extension or rotation of the neck exerts traction on these delicate filaments, resulting in spasm of the trapezius and sternomastoid muscles. In addition, spasm of the trapezius muscle exerts traction on the great occipital nerve at the point where the nerve pierces the tendinous attachment of the trapezius muscle, thereby greatly aggravating the occipital pain and headache.

The second cervical nerve root terminates as the great occipital nerve at the point where it pierces the tendinous attachment of the trapezius muscle at the base of the skull. Beyond this point it supplies the major portion of the scalp, the upper part of the neck and even portions of the face.

Mayfield⁶ showed that the second cervical root is more vulnerable to trauma than other cervical roots because it is not protected posteriorly by pedicles and facets which elsewhere in the vertebral column

form the posterior half of the root canal. The greatest rotation of the head on the neck is at the atlas-axis junction, which is the point of exit of the second cervical nerve root. Therefore, traction injury to this root is a most frequent happening in any of the major sprains of the cervical spine.

Occipital-Trigeminal Relations

A communication between the great occipital nerve (second cervical) and the first division of the trigeminal nerve by way of the spinal fifth tract in the medulla was described by Skillern.¹⁰ Pains caused by disturbance of the second cervical root begin in the suboccipital area, radiating upward toward the vertex and forward behind the homolateral eye. The patient often feels as if the eyeball is being torn from the socket. The headaches are migraine-like and often associated with nausea, vomiting and blurred vision. The author considers the work of Skillern a true contribution to the understanding of attacks of hemicrania following sprain of the cervical spine, and therefore suggests that the syndrome be named the Skillern syndrome.

CONTUSION OF THE SCALP

Another important and usually overlooked extracranial cause of headache is posttraumatic neuralgia of the scalp. Lesser scalp contusions, involving elements of the occipital or the trigeminal innervation, may seem to be the cause of recurrent severe and persistent headaches; but careful search often discloses a trigger area at the site of an old scalp contusion. In some cases, excision or blocking of such

areas has completely abolished attacks of hemicrania.

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